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COMMISSIONING PROCEDURES

AND

PERFORMANCE TESTS

**OIL AND NATURAL GAS CORPORATION LTD.
INDIA**

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<p>1.0 INTRODUCTION</p> <p>Contractor shall pre-commission, commission and carry out the Performance Tests on the Works including all the facilities of the Well Platform, associated pipelines, and Modification Works listed in Description of Works in the Bid Package.</p> <p>This procedure defines the following state of the Works:</p> <ul style="list-style-type: none"> • Mechanical Completion • Ready for Pre Commissioning • Ready for Commissioning <p>This Procedure also describes Performance Tests.</p> <p>For other requirements of testing refer Scope of Work, respective Design Criteria and Functional Specifications given elsewhere in Bid Document.</p> <p>A Pre-commissioning or Commissioning activity shall be considered to be complete only when it has been witnessed and the procedure and the results of successfully carrying out that procedure have been signed off by both Contractor and Company. Company may also require Vendor's representative to witness and sign that document.</p> <p>During all the pre-commissioning & commissioning activities, the Contractor shall involve Company's operating staff (nominated by the Company) and impart necessary techniques and know-how required for operation and maintenance of the facilities.</p> <p>To carry out pre-commissioning activities for the pipelines, wherever required, temporary launcher/receiver shall be arranged by the Contractor.</p>			
<p>2.0 DEFINITIONS</p> <p>2.1 Mechanical Completion</p> <p>Mechanical completion of a system include following but not limited to:</p>			

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<ul style="list-style-type: none"> ▪ All design and engineering has been completed ▪ All installation work for that system including all equipment has been completed in accordance with “Approved for Construction” drawings, specifications, applicable codes and regulations and good engineering practices. ▪ All instruments have been installed. ▪ All tie-in connections have been made. ▪ All factory acceptance tests and all other testing and inspection activities have been completed. ▪ Contractor has obtained approvals, which are the responsibility of the Contractor to obtain. ▪ Safety Studies have been completed and satisfaction of all the Safety Studies’ requirements have been met and all documentation put in place. ▪ All required documentation and certification documents required by the Contract have been supplied. ▪ All operating procedures and maintenance procedures have been forwarded to the Company well in advance for review. ▪ All items for which Contractor is responsible for obtaining third party, regulatory or Company approval have been obtained and confirmation documentation has been provided to Company. <p>Mechanical completion of Well Platform is defined as the state where all systems including utility and auxiliary facilities have reached the condition of mechanical completion and are certified as such by the company.</p> <p>Mechanical Completion of Modification Works is defined as the state when all the Modifications including all utilities & auxiliary facilities have reached the condition of mechanical completion and are certified as such by the Company.</p> <h2>2.2 Ready for Pre-Commissioning</h2> <p>The works are Ready for Pre-Commissioning when the Company has issued a certificate for Mechanical Completion and notification in writing that the Works is Ready for Pre – commissioning.</p>			

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<p>2.3 Pre – Commissioning Activities</p> <p>Pre-commissioning activities are activities to be performed after Mechanical Completion of a piece of equipment or system to make it safe and ready to receive hydrocarbons/ injection water and Ready for Commissioning. This include, but not limited to:</p> <ul style="list-style-type: none"> • Performance of all remaining works other than commissioning and Performance Tests. • Making operational and commissioning all systems that can be made operational before well fluids are introduced. • The completion and testing of the platform equipment & systems • Testing of all parts and systems of the Works including the communications systems (if required). • Provision of initial fill of packing, chemicals, inhibitors, lubricants, glycol, water and other stocks have been made. • Checking, site modifications. • Internal inspection of the vessels • Flushing/cleaning of vessels & piping • Calibration of PSVs . • Calibration of all the instruments • Loop checking. • Complete checking of the safety system • Checks on electrical system and other vendor packages including DCS etc. • The delivery, storage and cataloguing of all spares 				

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<ul style="list-style-type: none"> • Items for which a defect Notice are issued to be rectified and all defect Notices shall have been closed out. • The Completion Documents along with all Design Documents to As-Built • The preparation of the commissioning plan and submission to Company for review. • The hydro testing and pneumatic testing of vessels. • Training and briefing of the Company's and Contractor's personnel involved in commissioning. • Removal of all debris and construction equipment from Site. <p>Further details are given in Attachment-A.</p>					
<h4>2.4 Ready for Commissioning</h4> <p>Ready for Commissioning means the point at which the Company issues a certificate to the Contractor saying that the system is ready for commissioning.</p> <p>At this point all systems and equipment shall be at a stage where hydrocarbons/injection water can be safely introduced and all equipment can be safely operated with all controls and safety devices in service.</p>					
<h4>2.5 Design Capacities</h4> <p>The Maximum Design Capacity and Minimum Design Capacity are defined elsewhere in bid document.</p>					
<h4>3.0 EXECUTION OF PRE-COMMISSIONING ACTIVITIES</h4> <p>Contractor shall complete all the pre-commissioning activities in accordance with guidelines given in API – 700 and conditions stipulated under Attachment-A. Contractor shall write necessary procedures and obtain approval from Company prior to commencing work and shall carry out the work in accordance with approved procedures.</p> <p>The Contractor shall complete as many of the pre-commissioning activities as possible at the fabrication yard to minimize the working time in offshore. A</p>					

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guideline for carrying out the pre-commissioning activities at yard/offshore is given below. These are minimum requirements only.

Contractor shall repeat these yard tests in offshore in so far as is necessary to demonstrate that the equipment has not been damaged and that it is in the same condition as it was when first tested.

The Contractor shall submit a detailed schedule and procedure for carrying out these activities for approval by the Company before starting work.

3.1 Factory Acceptance Test Requirements (FAT)

As a minimum, Factory Acceptance Testing shall be required on the following packages:

- OCI Transfer Pump
- DCP Skid with Hose Reel
- Emergency Shutdown System (ESD)
- Well / Fire Shutdown Panel
- Test Separator/ Multi Phase Flow Meter
- Nav-Aid System alongwith battery, Solar Panel and solar power Controller,
- CP System
- Gas Detection System.

This list shall be considered a minimum. The Contractor shall define factory Acceptance Testing Requirements as a part of all Purchase Requisitions. This requirement shall be submitted to the Company for approval prior to the award of a purchase order.

The packages shall be tested with the ancillary equipment that is to be supplied with them.

Factory Acceptance Testing of Instrumentation related equipment shall be as per Functional Specifications of the respective instrument items.

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<p>A Factory Acceptance Testing shall be conducted prior to dispatch from the Vendors Works to determine that the assembled equipment meets the design requirements.</p> <p>The Contractor shall submit a full Factory Acceptance Test procedure 6 weeks prior to the Factory Acceptance Test to detail the full extent of testing of the equipment. The testing procedure shall be approved by the Company prior to the commencement of testing and shall be complete with all equipment procedures, checklists and safety requirements to be taken. The Contractor shall be responsible for providing all necessary equipment and utility services to conduct the tests. The Contractor shall ensure that an opportunity is given to all relevant parties to attend all hold and witness points during Factory Acceptance Testing.</p>					
<p>3.2 Minimum Pre-commissioning Activities to be carried out at Yard</p> <ul style="list-style-type: none"> ▪ Check systems conforming to the requirements of the P & I Ds, drawings and datasheets ▪ Complete any site modifications that may be required ▪ Testing of PSVs . ▪ Leak Testing ▪ Internal Inspection of Vessels ▪ Inspection of strainers/filters, orifice plates and other piping specialities. ▪ Operability test of all utility systems except those, which cannot be operated at the yard. Equipment shall be operated for a minimum of 4 hrs. ▪ System Flushing and Cleaning ▪ Operability test of all pumps and rotating equipment. ▪ Pre-commissioning activities related to instrumentation at yard shall be as follows: <ul style="list-style-type: none"> - Off line testing and calibration of instruments as reflected in P&IDs and safe charts - Installation and hook-up as per installation & hook-up standard drawings 					

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- Hydro testing of impulse tubing and other associated tubing
- On line testing and calibration checks of all instruments and loop checking of all such instruments
- Installation and hook-up of gas detector fusible plug, ESD/FSD stations etc.
- ESD/FSD loop testing
- Functional test and associated loop testing incoming and outgoing (to and fro) from well/ fire shutdown panel
- Functional test and associated loop testing related to Fire and Gas detection system
- Functional test and associated loop testing related to Telemetry Interface Cabinet
- Any other instrument related activity not listed above but mentioned in the relevant functional specifications elsewhere in the Bid Package

3.3 Minimum Activities to be carried out at Offshore after Installation and Hook – up

- Calibration checks of instruments and loop checking. All the system/equipment including Vendor's packages and Company supplied equipment (if any) shall be included.
- Charging of filter media, packing, lubes, chemicals etc.
- Repeat testing of PSVs
- System flushing
- System drying (Where applicable).
- System leak test. Water lines are also included.
- Pre-Commissioning checks for Switch gear, MCC.

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<ul style="list-style-type: none"> ▪ Testing and checking of electrical equipment for proper earthing, continuity, insulation resistance and secondary injection testing of relays after insulation resistance test, ratio test of transformer, stability check of different relays, high voltage test of cables, illumination level checking. ▪ Testing and checking of all life saving equipment. ▪ Calibration of gas/fire/smoke and H₂S detectors. Testing and calibration of Gas Detection System including various type of detector shall be followed as per Functional Specification of Gas Detection System, Spec. No. 3032. ▪ Operability test of material handling system. ▪ Operability test of fire fighting equipment including hose reels and fire suppression system etc. ▪ Inert gas purging (wherever applicable) for hydrocarbon system. ▪ Installation & calibration of all laboratory equipment/instruments and put them on operation. Detail requirement to be firmed up in detailed design phase. ▪ Checking of electrical power system, CP system, Battery capacity, Nav-Aid etc. ▪ Functional test of ESD and Gas Detection Systems . 					
<p>3.4 Pre-Commissioning Of Modification Works</p> <p>Contractor shall carry out modification works, interconnection and hook-up of facilities, as given under clause 2.3 of SCOPE OF WORK.</p> <p>It shall be Contractor's responsibility to carry out all necessary preparatory work like draining, venting, gas freeing, purging etc., for all the existing facilities required for modification and safe tie-in. It shall be Contractor's responsibility to arrange and provide steam, chemicals, nitrogen etc. required for gas freeing operations. It shall be Contractor's responsibility to ensure proper safety during tie-in/modification operation.</p> <p>It shall also be responsibility of the Contractor to carry out required pre-commissioning activities for the existing systems as given under clause 2.3 of SCOPE OF WORK.</p>					

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<p>4.0 COMMISSIONING</p> <p>Commissioning of the Well Platform and all Modification jobs involve the programmed introduction of hydrocarbons/ injection water and the operation of all systems in the manner intended.</p> <p>60 days in advance of the planned date for the issue of Ready for Commissioning, Contractor shall submit for approval a procedure to the Company giving complete details of the programme and procedures to be followed for commissioning. The procedure shall describe all activities and methods for executing these activities safely. It shall provide details of the rates, ramp up rates, configurations of equipment, throughput, train combination, operation of standby equipment and all other matters required to introduce hydrocarbons/ injection water to the Works, ramp up flows, test and prove the Works on hydrocarbons/ injection water and do all other things required by Company to commission the Works.</p> <p>After Company has given approval to commission the Works, hydrocarbons/ injection water will be introduced to into the Works. The flow of hydrocarbons/ injection water will be modulated as Company judges appropriate. At a time to be determined by the Company, the Company will determine that the Works is ready for Performance Tests and these tests will be conducted in accordance with the requirements of the Company.</p> <p>4.1 Shut down Requirements</p> <p>During part of the Modification Works and subsequent Pre-commissioning and Commissioning activities, some equipment in the existing Process / Well Platforms shall remain operating. The Contractor shall comply with all the permit and safety procedures of these platforms.</p> <p>The Platform Operations Group will control the scheduling and duration of any shutdown of the platform. The contractor shall submit Shutdown Schedule to the Company for approval as part of the Pre-commissioning and Commissioning Procedure. The shut down schedule shall include the following as a minimum:</p> <ul style="list-style-type: none"> ▪ A detailed list of all activities ▪ Estimated duration of each activity ▪ Float calculations for each activity ▪ Manpower Histogram for each shift of the shut down. 				

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Contractor shall also provide any request for service and access required e.g. requests for accommodation, access to utilities, crane usage requirements, deck area access requirements, permit requirements etc.

Contractor shall note that its use of Company's facilities is limited and the availability of these facilities cannot be assumed or assured (as is described elsewhere in the contract documents).

4.2 Purging and Cleaning Requirements

Contractor shall prepare procedures for all work on existing systems and submit them for approval before starting work. Before modifications work is carried out on any system, pipe work and equipment shall be prepared in accordance with approved procedures, gas freed and purged as appropriate and as required by Company.

The Contractor shall develop procedures for the purging of systems prior to the introduction of hydrocarbons. Included in this procedure shall be the purging and gas freeing of existing lines of the platform requiring modification. This procedure shall include the proposed method of purging to be used, the duration of the purge, the purge medium and the acceptance criteria used to determine a successful purge. This procedure shall be approved by the Company prior to the commencement of any works at the platform.

5.0 PERFORMANCE TESTS FOR WORKS

The Contractor shall carry out Performance Tests. The Contractor shall develop a detailed procedure for the performance tests in accordance with the requirements of the Contract and submit them to Company for Approval.

5.1 Maximum Rate Performance Test of Well Platform

A performance test of the Well platform shall be carried out to demonstrate that everything (including process facilities and utilities) meets its Contract requirement.

The test shall be arranged such that the inlet flow rate to the facilities is ramped up in suitable steps until the Maximum Design Capacity is reached. A 72 hour test period will commence once the process is in a stable operating mode at the Maximum Design Capacity. Any reduction/change to the throughput (outside a band of $\pm 3\%$) during the 72 hours will negate the test and it will be recommended

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<p>for another 72 hours once the flow rate has again stabilized at the design throughput.</p> <p>During the ramp up period process controls can be tuned. The appropriate process measurements shall be recorded from the beginning of the test, throughout the 72 hours period and during the ramp down.</p> <p>The performance test shall demonstrate that the works meet the requirements of the Contract. All equipment shall be tested to see that they meet the requirements specified (including capacities).</p> <p>The test must successfully demonstrate that all equipment operates to specification and the shutdown systems for each system and the overall facility, work as required.</p> <p>As part of the test, the process simulation model of the process must be updated and validated against operating data.</p> <p>At the end of the 72 hour test period, the flow rates shall be ramped down and process recordings continued until flow is stopped. The shut down systems can be tested during the ramp up and ramp down period, but should not be tested during the 72 hour stable operation period.</p> <p>The Contractor shall develop an extensive test procedure for the above, including details of all process measurements and analyses to be carried out.</p>				
5.2	Minimum Rate Performance Test of Well Platform Project			
<p>The test procedure described above shall be repeated at the Design Minimum Capacities but for a period of 12 hours.</p> <p>The Performance test shall demonstrate the works meets the Design requirements and demonstrate those things described in Section 5.1.</p>				
5.3	Performance Test of the Modifications			
<p>Performance test of the Modifications shall be carried out in a similar manner and scope to these nominated in Section 5.1 and 5.2.</p> <p>They shall demonstrate that the Modifications meets the requirements of the Contract over the range of rates between Maximum Design Capacity and Design Minimum Capacity.</p>				

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6.0 SPECIAL REQUIREMENTS

It shall be Contractor's responsibility to install, calibrate and make all laboratory and workshops equipment operable. Contractor shall involve Company's chemist and maintenance engineers and impart necessary techniques and know-how required for operation and maintenance of this equipment.

7.0 VENDORS' REPRESENTATIVES

The Contractor shall arrange manufacturer's representative (s) (at fabrication yard and offshore) of at least the following major equipment / systems during operability tests, pre-commissioning and commissioning and up until the satisfactory completion of the Performance Tests. This service shall be included in the lump sum costs quoted by the Contractor.

- DCP Skid with Hose Reel
- Deluge valve
- Control Valve.
- Shut Down Panel
- Gas Detection System.
- Nav-Aid System along with battery, Solar Panel and solar power Controller.
- Multi Phase Flowmeter.
- CP System
- 440/415 volt 50KVA Transformer, 660 volt Switchgear (Motor Control Center) DC/ AC Power Distribution Panels, cables, lighting, fixtures etc.
- 440/415 volt 3-phase, 50 KVA Transformer
- 600 volt Switchgear and Distributing AC/DC Power Panel
- Gas Detection System.

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The Contractor shall submit in their offer at bid stage to the Company the schedule and minimum duration for calling Vendor's Representative at yard/offshore.

The Contractor shall reconfirm the schedule and duration (of vendor representative) three weeks prior to pre-commissioning, which shall be strictly complied.

It is Contractor's responsibility to retain Vendor's Representative at site if job is not completed within the period indicated in the offer.

Contractor shall inform the Company about completion of job and shall take approval from the company before sending vendor's representative back from yard/offshore.

8.0 DOCUMENTS TO BE SUBMITTED

8.1 Operating Manual

The Contractor shall prepare a draft start-up and Operating Manual for all of the facilities that are included in the Works and submit to Company at least 90 days prior to start of pre-commissioning activities for approval. Quantity of operating manuals requirement for all equipments shall be provided as per respective specification given elsewhere in bid package. The related attachments will go with each manual. The following information shall be included:

- Design basis
- Description of facilities
- Pre-commissioning checks
- Start-up, normal operation & shut down procedures for each equipment.
- Platform start-up procedure.
- Platform normal operation procedure
- Platform shut down procedure (normal/emergency)
- Vendor instructions for all equipment for normal operation and trouble shooting.

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<ul style="list-style-type: none"> • Emergency procedures. • Operating parameters and set points of different alarms and trip devices • Summary of chemical consumption including list of recommended Indian equivalent. • Summary of utilities consumption for each equipment. • Lubrication Schedule (include Indian equivalent, initial fill, frequency of change of lubricant and 6 months requirement) • Gas detection system operation, calibration and maintenance procedure. • Life saving devices operation and maintenance procedure. • Routine structural maintenance check. • List of equipment (showing skid size, weight, purchase order no., vendor data book reference tag no.) • Effluent disposal. 					
<p>The manual shall have the following attachments as minimum:</p> <ul style="list-style-type: none"> • Reduced size copies (275 mm x 425 mm) of line lists • Equipment and instrument data sheets in accordance with purchase order • Electrical Single line diagrams, area classification drawings and control schemes • Pump characteristic curves • Process Flow Diagrams (PFDs) & Piping and Instrumentation Drawings (P & IDs) • Recommended Performa for recording routine parameters during normal operation for all equipment. • Equipment Layout 					

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<ul style="list-style-type: none"> • Safety Escape Routes • Field Location Maps. • Layout and Location Maps For Fire And Safety Equipments <p>The Contractor shall submit the draft Operating Manual to the Company for Approval. The Contractor shall discuss the comments with Company & incorporate the comments in the final document. After the document is approved by the Company/Engineer's representative, Contractor shall make the required number of copies, specified elsewhere and submit to the Company/engineers representatives. This manual shall be followed during start-up and commissioning of the facilities. Vendor operating maintenance manuals shall be submitted along with the final operating manual.</p> <p>The operation manual can be divided into two or three parts if the thickness of manual exceeds 80 mm. It shall describe, pre-start up checks, start-up procedures, shut down procedure and normal operation for an equipment vendor recommended procedure and integration of that equipment with other facilities. Contractor shall also submit 90 days before the commissioning the system operating Manual for the DCS, which shall contain system description, operating instructions and necessary information for the familiarization of the operator.</p> <p>8.2 Pre-commissioning Documents:</p> <p>The contractor shall submit a detailed schedule for carrying out the pre-commissioning activities in a network form.</p> <p>At least 120 days in advance of start of pre-commissioning activities, Contractor shall prepare detailed format of checklists of pre-commissioning and commissioning activities for each equipment/system. The Contractor shall submit the said format for approval of the Company. These check lists shall describe the checks/test to be carried out on each equipment/system, shall also indicate if a particular check/test is to be carried out at the yard or offshore.</p> <p>All the check list points shall be dealt by the Contractor. Determination of the system readiness for commissioning shall be determined based on the relevant portion of check lists have been completed by the Contractor.</p> <p>For the purpose of execution of these pre-commissioning activities, the entire platform shall be divided into system and sub-systems. The pre-commissioning document shall contain the following:</p>			

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<ul style="list-style-type: none"> • System / sub-system identification. • Detail procedures for the various pre-commissioning activities, such as system check, flushing, de-watering, drying, leak test, purging etc. with format to record the observations of the activities carried out. • Procedures and formats for recording the operability test/performance test for different equipment/system. • Lube schedule, indicating the nomenclature (Indian equivalent) of lubes, quantity of initial fills. • Listing of commissioning and start up spares. • List of spares for one years operation and vendor recommended spares for vendor's package items. • List of pre-commissioning activities to be carried out at fabrication yard, or offshore, or at both places. • High-pressure leak check procedure of gas system. • A detailed procedure for management of any special bypass or defaults required for commissioning. <p>The Contractor shall submit a draft pre-commissioning documents 120 days before the activities are to be carried out. The document shall be reviewed by the Company. The Contractor shall submit a revised document after incorporating Company's comment for approval to the Company. The approved document shall be submitted 60 days prior to starting of the pre-commissioning activities.</p> <p>At the end of pre-commissioning activities, all the pre-commissioning test records(duly signed) shall be compiled by the Contractor, by system. Three copies of documents for each system shall be delivered to the Company.</p> <h3>8.3 Modification/Hook up Procedure</h3> <p>During part of the Modifications Work and subsequent Pre-commissioning and Commissioning activities, some equipments of the platform shall remain operating. The Contractor shall schedule all activities to minimize disruption. The Contractor shall comply with all the permit and safety procedures of platform.</p>			

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Contractor shall produce a procedure with his detailed shut down requirements for the various hook-ups required to be carried out on the platform. This shall be presented to Company for approval within 60 days of Notification of Award.

Contractor shall submit, along with Pre-commissioning procedure, a detailed procedure for carrying out modification works, interconnections and hook-up operations for the facilities. An Isolation scheme to be prior to carrying out modification works shall be worked out in advance and detailed in this document.

8.4 Commissioning Procedure

The Contractor shall prepare this document to detail out the procedures and sequence of commissioning of the project facilities including the log sheets for logging of parameters of different equipments/system during commissioning. The Contractor shall have required inputs from the Company and the Vendor's representatives. The document shall also include the shift rosters for the Contractor/Vendor's representatives to be deployed during commissioning operation. This document shall be submitted to the company for approval, 60 days prior to the commencement of commissioning operation.

8.5 Other Requirements

The Contractor shall provide safety equipment locations, H₂S safety information chart, warning signs and escape route drawings (framed). These drawings must be placed in locations approved by the Company before the platform is commissioned. The Contractor shall also provide adequate numbers of NO SMOKING boards, which will be installed where required by the Company.

In addition to the other requirements of the Contract, Contractor shall supply adequate sets (A3 size) of Process & Instrument Drawings, Electrical Single Line Diagrams to the Company to facilitate system check before start of hook-up work. The Contractor shall also provide two sets of PFDs on acrylic sheets, which will be installed at locations specified by the Company.

9.0 YARD CHECKOUT BEFORE LOAD OUT

Prior to load out, the Contractor shall carry out, at the yard, a check of the facilities for correct erection and installation, operability, maintenance requirement and safety of plant and personnel during operation in accordance with accepted international good engineering practices, this will be witnessed by the Company. The Contractor shall carry out all modifications and corrections in

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<p>accordance with the final punch list prepared jointly by the Contractor and the Company.</p>					
<p>10.0 MANPOWER FOR COMMISSIONING</p> <p>For commissioning of the platform, Contractor shall deploy personnel with experience in operation of similar facilities, commissioning shall be round the clock uninterrupted operation. The Contractor shall arrange & provide all categories of personnel i.e. shift engineers, operators, technician, chemist, safety engineer etc. required for manning the platform during commissioning operations.</p> <p>The Contractor shall submit the commissioning organization chart with details of the experience and qualifications of key commissioning personnel for approval to the Company. Contractor shall modify the charts to incorporate Company requirements. Contractor shall submit this chart along with pre-commissioning documents.</p>					
<p>11.0 SPARES, UTILITIES ETC.</p> <p>The Contractor shall be responsible for supply of all the spares and consumables till the platform including any modifications are mechanically completed, pre-commissioned/commissioned and handed over to the company.</p> <p>All utilities required during pre-commissioning/commissioning of the facilities, including power, water, air, cranes, etc. shall be provided by the Contractor. In no case the facilities provided on the platform shall be used for this purpose unless authorized by the company.</p> <p>It shall be Contractor's responsibility to supply lubes, chemicals, purging materials and other pre-commissioning/commissioning aids required till the platform is handed over to the company. It shall be contractor's responsibility to repair any damage to the system occurred during load out, transportation and installation and pre-commissioning of the facilities.</p> <p>The Contractor shall maintain a record of the start up spares consumed during pre-commissioning and hand over the balance items to the company.</p>					
<p>12.0 HANDING OVER OF MATERIALS</p> <p>After the mechanical completion and completion of pre-commissioning activities for all the systems installed on the platform by the Contractor, the Contractor shall</p>					

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<p>hand over to the company all the materials which shall include but not limited to the following:</p> <ul style="list-style-type: none"> - Special tools and tackles - Commissioning spares - Spares as specified in relevant functional specifications 			

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ATTACHMENT-A

1.0 PRE-COMMISSIONING CHECKLIST

This checklist represents the absolute minimum of work, which has to be performed by the Contractor prior to commissioning of the facilities. It is not intended to be a complete list of activities required. Manufacturers instructions for pre-commissioning checks/ testing shall be followed for all equipment.

1.1 General Procedures

The general work procedures listed below outline the work to be performed by the Contractor. Other procedures applicable to specific system or items of equipment may be covered elsewhere in the contract.

1.2 Packing and Seals

- Install mechanical seals, permanent packing and accessories wherever required.
- Adjust and replace mechanical seals, packing and accessories, as necessary, during pre-commissioning period.

1.3 Removal of Temporary Supports

Removal all temporary supports, bracing or other foreign objects that were installed in vessels, transformers, piping, rotating machinery or other equipment to prevent damage during shipping, storage and erection.

1.4 Alignment of Rotating Equipment

- Rotation checks and check rotating machinery for correct direction of rotation and for freedom of moving parts before connecting driver.
- Make cold alignment to the manufacturer's tolerances along with Company. Provide all the alignment readings records to Company. Contractor shall prepare the formats (unfilled) and submit to Company for approval.
- Check all lubricants and their quality, fill etc. before operating the equipment.

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<ul style="list-style-type: none"> • Carry out uncoupled run of motors, check bearing temperatures, vibration, no load currents, over current trips, function of different safety devices and carry out adjustments as required. • Make hot alignment and any dowelling required after equipment has been put in operation. • Obtain manufacturer representative for equipment as required during installation and/or pre-commissioning and commissioning. 					
<p>1.5 Tie-ins at Unit Limits</p> <p>Prepare all systems for safe tie-ins with bridge connected platform or with existing operating systems. Contractor shall prepare the systems for Tie-ins in consultation with Company and will be responsible for safety during tie-ins being made. Contractor shall gain approval of Company for the safety measures to be taken by them before any tie-in work is taken up.</p>					
<p>1.6 System Check / Inspection</p> <ul style="list-style-type: none"> • Provide inspection facilities to the Company to check that erected facilities conform to Process & Instrumentation Diagrams, construction drawings, vendor drawings and specifications approved for construction. • Verify and approve the facility check. Note exceptions, if any, on a separate work order list. 					
<p>1.7 Site Modifications</p> <p>Carry out site modifications as found necessary during system checks and inspection from the viewpoint of routine operations, maintenance and safety of the platform. A list of such jobs shall be prepared by the Company and shall be handed over to the Contractor for execution.</p>					
<p>1.8 Flushing</p> <p>Perform flushing and blowing of all piping to remove dirt, welding slag, etc. Arrange for cleaning media for carrying out flushing/blowing and disposal of the cleaning media in accordance with minimum procedures to be developed by the Contractor and approved by the Company. Following is the minimum velocity of cleaning media to be maintained for flushing/blowing of piping:</p>					

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<ul style="list-style-type: none"> ▪ AIR - 2.4 – 2.7 m/sec. ▪ WATER - 1 – 1.2 m/sec. 					
<h3>1.9 Temporary Screens, Strainers and Blinds</h3> <ul style="list-style-type: none"> • Provide and install temporary strainers where required. Install permanent strainers after initial operation. • Clean strainers as required during pre-commissioning and commissioning. • Provide, install and remove all blinds required for flushing or operation. • Change gasket if necessary. 					
<h4>1.9.1 Leak Tests</h4> <ul style="list-style-type: none"> • After completion of all pre-commissioning activities, safety checks and hydro test, leak test of complete process facilities including piping, equipment, instrument connections etc. with air at a pressure of 3-4 kg./cm² is to be carried out in accordance with approved procedure. However, in no case the design pressures shall be exceeded. • Notify the Company of test schedule at least two weeks in advance. All the tests are to be witnessed and the test record on satisfactory completion of the test be signed by Company. • Provide 4 copies of all the test records to the Company. • Provide any special media for test purpose if required and provide facilities for disposal. 					
<h4>1.9.2 Vacuum Test</h4> <ul style="list-style-type: none"> • Rectify any leakage source. 					
<h3>1.10 Safety Devices</h3> <ul style="list-style-type: none"> • Provide the Company with a list of settings for safety devices. • Install all safety devices on the equipment. 					

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	<ul style="list-style-type: none"> • Test and adjust all safety devices such as PSVs, TSVs at offshore and seal wherever necessary. 		
1.11 Purging			
	<p>Install necessary purge connections and carry out system purging including that of flare and vent with Nitrogen in accordance with Company approved procedure. The final Oxygen content in purged systems shall be reduced to an approved safe limit. Contractor shall arrange & supply the Nitrogen required for purging.</p>		
1.12 Drying out			
	<p>Dry out facilities wherever required by Company.</p>		
1.13 Lubricants and chemicals			
	<ul style="list-style-type: none"> • Procure and supply initial fill of all lubricants, chemicals, resins, desiccants and other similar materials, replenish the chemicals consumed during pre-commissioning and commissioning. • Inspect vessel interior along with Company / certifying authority before filling of chemicals for proper cleanliness. 		
1.14 House Keeping			
	<p>Provide continuous cleanup of the construction and operational area. Remove excess materials, temporary facilities and scaffolding and pick up trash. Perform washing for further cleanup as required.</p>		
1.15 Equipment Protection and Spare Parts			
	<ul style="list-style-type: none"> • Protect equipment from normal weather conditions, corrosion or damage before commissioning. • Provide all installation and commissioning spares. 		
1.16 Chemical Cleaning			
	<p>Perform special chemical cleaning or pickling of the critical piping and compressor suction piping, etc. in accordance with vendors approved procedures.</p>		

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1.17 Fire Fighting & Life Saving Equipment

- Ensure correct installation of all fire fighting and life saving equipment.
- Carry out function test of fire detection and suppression system.

1.18 Miscellaneous

To carry out any other check/test as required by Company and provide all test certificate as required by the Company.

1.19 Operability test for a system/equipment

- The Contractor shall provide a procedure for carrying out the operability test of each equipment/system to prove that the equipment/system installed meet the design specification. This procedure shall include log sheets wherein the operating parameters shall be recorded hourly.
- Each system or piece of equipment shall be subjected to an operability test to determine that it operates in accordance with its specifications and the design intent over the full range required by the Design Criteria. The operability test shall be conducted, using all ancillary equipment, auxiliaries and controls, continuously for the duration specified in these documents after stability conditions have been attained. If no duration is specified the test shall be conducted for 4 hours after stability has been attained. If the test is interrupted due to any reason, the test shall be started afresh.
- The operability test shall be carried out by the Contractor and the vendor's representatives, wherever applicable and witnessed by Company.
- The Contractor shall make necessary checks, adjustment, repairs required for normal operation of the system/equipment. All the safety devices shall be tested for their proper operation.
- Upon completion of the Operability test, the log sheet with all observation shall be signed by the Contractor, Vendor, Company representatives. The Performance shall be evaluated based on the data and observations made during the operability test. In case of any dispute, the decision of Company shall be final.